EFFECTS OF AGING, TEMPERATURE, MOIST AGGREGATES AND FILLER TYPE ON PERFORMANCE OF WARM MIX ASPHALT INCORPORATING RH-WMA ADDITIVE

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by

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LIST OF ABREVIATIONS

A	Aging
AASHTO	American Association of State Highway and Transportation Officials
AC	Aging Condition
AI	Aging Index
ANOVA	Analysis of Variance
APA	Asphalt Pavement Analyzer
ASTM	American Society for Testing and Material
BBR	Bending Beam Rheometer
BBS	Asphalt Binder Bond Strength
CEI	Compaction Energy Index
CGN	Compaction Gyration Number
PC	Percentage Change
CS	Creep Stiffness
DSR	Dynamic Shear Rheometer
DTT	Direct Tensile Tester
GHG	Greenhouse Gas
GLM	General Linear Model
HMA	Hot Mix Asphalt
HWTT	Hamburg Wheel Tracking Test
ITS	Indirect Tensile Strength
LTA	Long-Term-Aging
MT	Mixing Temperature

OAC	Optimum Asphalt Content
PATTI	Pneumatic Adhesion Tensile Testing Instrument
PAV	Pressure Aging Vessel
PG	Performance Grade
PMB	Polymer-Modified -Binder
PMD	Pavement Modifier
PWD	Public Work Department
RAP	Reclaimed Asphalt Pavement
RAS	Recycled Asphalt Shingle
RH	RH-WMA
RSM	Response Surface Methodology
RTFO	Rolling Thin Film Oven
RV	Rotational Viscometer
SBR	Styrene-Butadiene-Rubber
SBS	Styrene-Butadiene-Styrene
SMA	Stone Mastic Asphalt
STA	Short-Term-Aging
TDI	Traffic Densifications Index
TSR	Tensile Strength Ratio
TT	Test Temperature
UTM	Universal Testing Machine
VAI	Viscosity Aging Index
VFA	Voids in Filled Asphalt
VMA	Voids Mineral Aggregate

VOC	Volatile Organic Compounds
VTM	Voids in Total Mixture
WMA	Warm Mix Asphalt

LIST OF SYMBOLS

G_{mb}	Bulk Specific Gravity
G*	Dynamic Modulus
G’	Elastic Component or Storage Modulus
Na_2CO_3	Sodium Carbonate
G*/sin δ	Superpave™ Rutting Factor
G*sin δ	Superpave™ Fatigue Factor
G_{mm}	Theoretical Maximum Density
G"	Viscous Component or Loss Modulus
δ	Phase Angle

KESAN PENGUSIAAN, SUHU, AGREGAT LEMBAP DAN JENIS FILLER KE ATAS PRESTASI CAMPURAN ASFALT SUAM YANG MENGANDUNGI BAHAN TAMBAH RH-WMA

ABSTRAK

Campuran asphalt panas (HMA) telah menjadi bahan utama yang digunakan di dalam turapan sejak beberapa dekad yang lalu. Sejak kebelakangan ini, berbanding campuran HMA konvensional, campuran asfalt suam (WMA) telah menunjukkan potensi yang besar dan ber manfaat tidak dapat diperolehi daripada campuran HMA, kerana campuran WMA boleh dihasilkan pada suhu yang lebih rendah tanpa memberi kesan kepada prestasi turapan. Bahan tambah WMA boleh mengurangkan kelikatan pengikat. Oleh itu, suhu pengeluaran dan pemadatan adalah lebih rendah berbanding campuran HMA konvensional. Salah satu bahan tambah yang digunakan untuk menghasilkan WMA adalah sejenis lilin yang dinamakan sebagai RH-WMA. Di dalam tesis ini, ciri-ciri reologi asfalt PG64 dengan dan tanpa RH-WMA pada keadaan penuaan yang berbeza telah dikaji. Secara keseluruhan, keputusan ujian reologi pengikat menunjukkan bahawa kandungan RH-WMA telah memberi kesan yang signifikan terhadap parameter reologi asfalt pengikat dari segi kelikatan, G*/sin δ dan G*sin δ. Teknik analisis imej telah digunakan untuk mengelaskan kegagalan perekatan dengan menggunakan ujian hentaman. Ujian hentaman telah dijalankan terhadap acuan baru yang telah direka khas dan kesan keadaan penuaan dan suhu ujian asfalt pengikat dengan RH-WMA telah dikaji. Analisis keputusan menunjukkan bahawa penuaan jangka masa pendek dan panjang asphalt pengikat telah meningkatkan kegagalan rekatan. Suhu pembinaan (campuran dan pemadatan) telah dikurangkan dengan penambahan bahan tambah RH-WMA yang menyebabkan penurunan kadar